

Weekly Updates – Vinayak Gajendra Panchal

I designed five collision scenarios in SUMO, all involving accidents caused by an **EGO VEHICLE**. Details of these scenarios are discussed in detail below.

For all scenarios, I stored the following data output files (in both XML and CSV):

1. Collision data
2. Floating Car Data (FCD) output
3. Full output
4. Lane change output
5. Statistics output
6. Summary output

Simulation setup (All scenarios):

Step-length	0.10 sec (10 cycles/sec)
Collision.action	remove
Collision.stoptime	30 sec
Collision.check-junctions	True

Scenario 1: 3 Lane 4 Way intersection (with TRAFFIC LIGHTS) collision at an intersection by an EGO-VEHICLE (Krauss Car following model) that doesn't follow traffic rules.

In this scenario, an ego vehicle surpasses the red light to collide with a rule-following vehicle at the junction of a 3-way intersection. Additionally, due to collision, a vehicle behind (secondary vehicle with Krauss Car following model) the ego-vehicle also collides with the ego-vehicle. Rest vehicles at that lane halt after the accidents of three vehicles until those vehicles have been removed from the scenario.

Setup:

Number of vehicles: 11 (1 EGO, 1 SEC VEH, 9 DEFAULT_VEHICLE)

Default vehicle parameters were not changed.

EGO VEHICLE vType parameter:

Parameter changed	Value	Reason
minGap	2.0 m	The minimum gap between vehicles reduced
driveAfterRedTime	10 sec	The vehicle will disobey the red light within the first 10 seconds of the red light being activated.
driveRedSpeed	5 m/s	Speed after red signal is violated
Algorithm CFM	Krauss	
Tau	0.1	Kept the same as step-length
color	red	

Rear Collision Secondary Vehicle vType parameter:

Parameter changed	Value	Reason
Tau (Krauss CF model)	0.09	For rear-end collision (tau less than step-length i.e. 0.1)
color	blue	

Vehicle Delays (in sec):

Col_veh_ego (ego vehicle – v_1), v_6, v_0	0
Col_cfm (secondary variable – v_4)	0.40
v_3, v_5	15.0
v_2	0.55
v_10, v_8	10.0
v_9	5.0
v_7	20.0
Stop_mode for v_3	25
Stop_mode for v_7	22.5

Output:

Red vehicle: EGO vehicle, blue vehicle: rear collision secondary vehicle, yellow vehicle: default vehicle.



Scenario 2: 3 Lane 4 Way intersection (with TRAFFIC LIGHTS) rear collision at lane by an EGO-VEHICLE (EIDM car following collision parameters) with set collision parameters.

In this scenario, an ego vehicle follows an EIDM car-following model with rear collision parameters. The ego vehicle collides with the normal vehicle at a red signal at the rear end.

Setup:

Number of vehicles: 12 (2 EGO, 10 DEFAULT_VEHICLE)

EGO VEHICLE:

Parameter changed	Value	Reason
Algorithm CFM	EIDM	Additional parameters to make vehicles jerk and driver imperfection
Decel	6 m/s ²	Increased this to make it slower to stop
emergencyDecel	8 m/s ²	Increased this to make it slower during an emergency
tau	0.05	For rear-end collision (tau less than step-length i.e. 0.1)
CollisionMinGapFactor	0.5	Decreased this for chances of collision
sigmaerror	0.5	Increasing the driver error magnitude
jerkmax	5.00 m/s ³	Making more frequent acceleration changes by increasing this
color	red	

Vehicle start positions and flow attribute parameters:

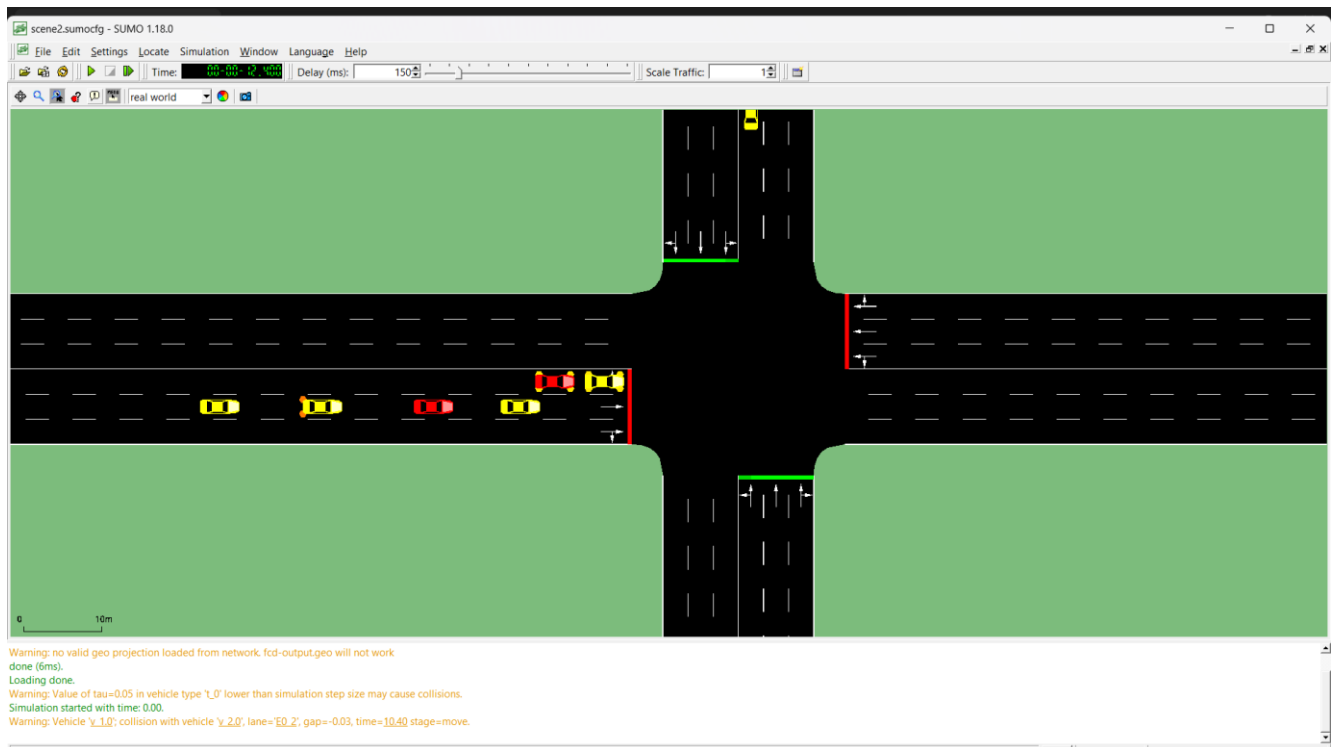
Ego vehicle: departPos: 30 m, flow param (end: 10 s, vehsPerHour: 720, i.e. 2 cars)

Flow vehicle 0: departPos: 10 m, flow param (end: 10 s, vehsPerHour: 720, i.e. 2 cars)

Flow vehicle 1, 2: departPos: 0 m, flow param (end: 20 s, vehsPerHour: 720, i.e. 4 cars)

Output:

Red vehicle: EGO vehicle, yellow vehicle: default vehicle.



Scenario 3: 1 Lane 4 Way intersection (with RIGHT-OF-WAY) collision at the junction by an EGO-VEHICLE (Junction collision and EIDM collision parameters).

In this scenario, an ego vehicle follows an EIDM car-following model with rear collision parameters and junction collision parameters (foe probability and speed ignore). The ego vehicle collides with the normal vehicle during its right-of-way turn (priority). Rest vehicles at that lane halt after the accident until those vehicles have been removed from the scenario.

Setup:

Number of vehicles: 12 (1 EGO, 11 DEFAULT_VEHICLE)

EGO VEHICLE:

Parameter changed	Value	Reason
Algorithm CFM	EIDM	Additional parameters to make vehicles jerk and driver imperfection
Decel	6 m/s ²	Increased this to make it slower to stop
emergencyDecel	8 m/s ²	Increased this to make it slower during an emergency
tau	0.05	For rear-end collision (tau less than step-length i.e. 0.1)
tpreview	2.0	Decreased this for late and hard braking at the junction

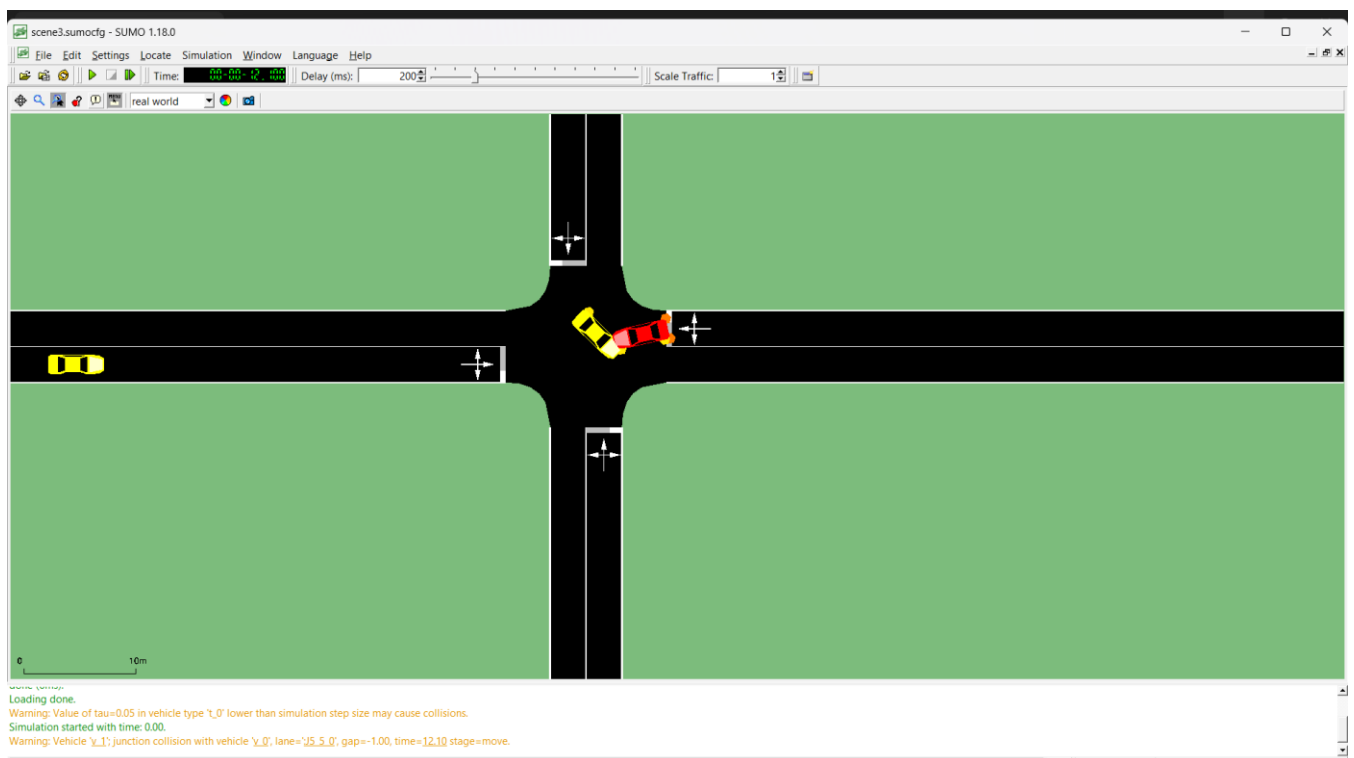
sigmaerror	0.5	Increasing the driver error magnitude
jerkmax	5.00 m/s ³	Making more frequent acceleration changes by increasing this
ignoreFoeProb	0.7	High probability will ignore the foe vehicle (mostly for right-of-way/ priority vehicle)
ignoreFoeSpeed	60 m/s	Speeds of foe vehicle below this will be ignored
color	red	

Vehicle delays and flow attribute parameters:

Ego vehicle (v_1)	Delay: 0 s
v_0	Delay: 0.20s
f_0, f_1	flow param (end: 25 s, vehsPerHour: 360, i.e. 5 cars)

Output:

Red vehicle: EGO vehicle, yellow vehicle: default vehicle.



Scenario 4: 3 Lane 4 Way intersection (with TRAFFIC LIGHTS) collision at the junction by an EGO-VEHICLE (Junction collision and EIDM collision parameters) but EGO-VEHICLES follow traffic rules.

In this scenario, an ego vehicle follows an EIDM car-following model with rear collision parameters and junction collision parameters (foe probability and speed ignore). The ego vehicle collided with a regular vehicle (container type) at the junction as it made an incorrect left turn despite being aware of the approaching regular vehicle. Rest vehicles at that lane halt after the accident until those vehicles have been removed from the scenario.

Setup:

Number of vehicles: 6 (1 EGO, 1 CONTAINER TYPE, 4 DEFAULT_VEHICLE)

EGO VEHICLE:

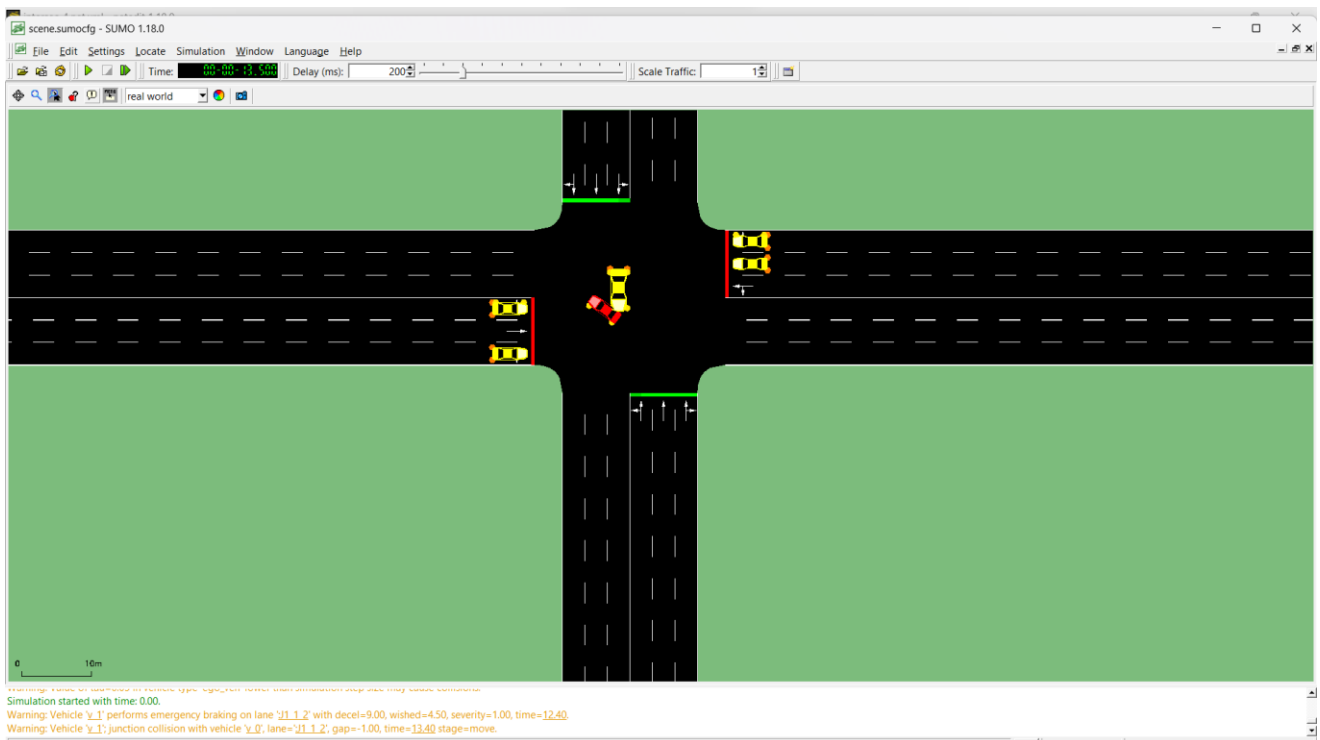
Parameter changed	Value	Reason
Algorithm CFM	EIDM	Additional parameters to make vehicles jerk and driver imperfection
tau	0.05	For rear-end collision (tau less than step-length i.e. 0.1)
tpreview	2.0	Decreased this for late and hard braking at the junction
sigmaerror	0.5	Increasing the driver error magnitude
jerkmax	5.00 m/s ³	Making more frequent acceleration changes by increasing this
ignoreFoeProb	0.5	High probability will ignore the foe vehicle (mostly for right-of-way/ priority vehicle)
ignoreFoeSpeed	60 m/s	Speeds of foe vehicle below this will be ignored
color	red	

Vehicle delays and flow attribute parameters:

Ego vehicle (v_0), t_0, t_1, t_2, t_3	Delay: 0 s
v_1 (container type)	Delay: 2.75 s

Output:

Red vehicle: EGO vehicle, yellow vehicle: default vehicle of container type.



Scenario 5: 3 Lane 4 Way intersection (with TRAFFIC LIGHTS) rear collision due to lane change by an EGO-VEHICLE (EIDM and Lane change collision parameters). (Still working)

In this scenario, I tried to use the flow vehicles attribute to capture collisions. 2 vehicle types were used, one being EGO and the other a regular vehicle. Collisions happened due to bad lane changes by ego vehicles. Still working on this to properly construct this scenario with a smaller number of vehicles.

Currently referring to an article for this simulation:

<https://repository.lib.ncsu.edu/bitstream/handle/1840.20/39778/etd.pdf?isAllowed=y&sequence=1>

Setup:

EGO VEHICLE:

Strategic	0.5
Cooperative	1
speedGain	3
keepRight	1
Assertive	10
lookaheadLeft	0.5
speedgainRight	10
overtakeRight	1
Algorithm CFM	Krauss

Vehicle flow attribute parameters:

f_0 (ego vehicle), f_1	flow param (end: 30 s, vehsPerHour: 3600, i.e. 30 cars)
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Output:

Red vehicle: EGO vehicle, yellow vehicle: default vehicle.

